An Experimental and Modeling Approach to Evaluate Environmental Water Effects on Threatened Delta Smelt

#0068

Technical Panel Review

Proposal Name: An Experimental and Modeling Approach to Evaluate Environmental Water Effects on Threatened Delta Smelt

Applicant Organization: U.S. Fish and Wildlife Service

Principal Lead Investigator(s):
Castillo, Gonzalo
Fujimura, Robert

Amount Requested: $1,803,276

TSP Panel Summary of Findings:

This research is highly relevant and the team is well situated to conduct this research (particularly the culture, marking and mark−recapture research). The central dilemma in use of water and preservation of biota is contained in this proposal. If the chronic withdrawal of water is not analyzed, there is decreased hope that the more episodic variations and their interactions with annual and perennial fishes can be understood. This proposal strikes at the base of the Bay−Delta complexity in a remarkabley simple way. In addition, the combination of experimental and modeling work is appropriate.

However, the panel voiced numerous reservations about the project as described. Portions of the proposed work are poorly described (in particular Tasks 6−8, i.e, the data analysis and modeling components). Feasibility of certain components has not been fully evaluated (e.g., photonic marking of juveniles; release locations; etc.). Quick feasibility tests could be conducted before committing large funds to this project. Also, it is not clear that mark−recapture experiments will examine entrainment processes in a sufficiently detailed manner (size effects, season effects, etc.). It is noteworthy that modeling analyses (which are critical for placing this work in a population and system−wide context) are not clearly described. (Two reviewers question the qualifications of these researchers to conduct modeling analyses). The price of doing this work is a major drawback. The budget includes significant

requests for salaries for both university and agency biologists, which in the panel's opinion is not appropriate.

The panel felt this topic is of high relevance to the Delta's future. However, there were several reservations and the panel recommends conditions and revisions to the project. While the proposal was initially rated as sufficient, with these changes, the proposal would rate as above average. The panel supports a 2-year pilot project for $670,000. As described in the proposal, the panel does not support tasks 7-8. In addition, since the panel is advocating a pilot project, they suggest that reduced costs can be accommodated by decreasing the number of smelt to culture.

Relevance to PSP Topic Areas:

High

TSP Technical Rating:
Sufficient

TSP Funding Recommendation:
Fund w/conditions

TSP Amount Recommended: $**670,000**

Conditions:

1. The panel recommends a reduced overall budget of $670,000. 2. Conduct a pilot test to ensure the feasibility of the project. 3. Re-evaluate the budget, especially the university and agency staff time. 4. Evaluate the feasibility of certain components (e.g., photonic marking of juveniles; release locations; etc.). 5. Determine the efficacy of mark-recapture experiments. 6. Remove tasks 7 and 8. 7. Decrease the number of smelt to culture.

External Technical Review #1

Proposal Title: An Experimental and Modeling Approach to Evaluate Environmental Water Effects on Threatened Delta Smelt

Proposal Number: 0068

Proposal Applicant: U.S. Fish and Wildlife Service

Purpose

Comments	**The goals, objectives and hypotheses are clearly stated, internally consistent and biologically realistic. The idea is timely and important – entrainment losses and incorporation of entrainment mortality in a population model are two extremely important pieces in the smelt population biology puzzle.**
Rating	**Above Average**

Background

Comments	**The conceptual model is well founded, clearly described, and logically supports the proposed work. It is a realistic picture of what may be happening regarding entrainment and Delta smelt biology/population dynamics. The proposal is sound based on the published literature, although I am always a bit uncomfortable when unpublished reports (e.g., cited reports &Smith 2006) and in one case, a "working document" (i.e., Armor et al.)** **How is it possible that no estimates exist for Delta smelt at SWP and CVP –– perhaps those agencies should pay for the entrainment studies?**
Rating	**Above Average**

Approach

Comments	**This approach is appropriately designed, and well documented. The roles of the PI's and staff are clearly defined and resources certainly are adequate for completion of the proposed tasks. Products of value will be obtained for regional, state and federal CALFED user groups. I am concerned about the few (n=3) publications that the PI's have promised to write and certainly this does not represent "good value" for the money that is being spent. Frankly, if you gave 1.8 million to any competent faculty member with an active research/graduate group, you could probably get 3 times the number of papers in peer−reviewed journals proposed by these PI's. In addition, I find the "local approach" taken by the PI's to information dissemination to be inadequate, given the funds provided. The PI's should be presenting papers at national/international meetings as well as local ones. The problems involved in Delta smelt restoration are relevant to situations outside California. Some specific comments follow below.** **It is difficult to evaluate the methodology for Task 2 because it assumes that entrainment/responses will be the same for both cultured and wild Delta smelt. This assumption is based on results from a poster presented at a meeting, to which an external reviewer has no access. It would be nice to see further work done on this question, because we know that wild smelt may have significant toxicant burdens (Bennett 2005) which might affect their ability to avoid entrainment. The same comment applies to differences in "energy dynamics" (e.g. fat storage) between wild and cultured smelt.** **It would have been nice to get an indication of "handling/marking mortality" for marked smelt. Nothing is said about this in the methods for Task 3, although there is a cursory description later in the proposal. What is survivorship like for marked vs. unmarked**

smelt? Some laboratory studies, especially in a flow tank could determine whether the marking methods produce significant mortality or not. This could be crucial for field studies. In addition, it is unclear how many fish will be individually marked versus batch marked. There are many recent advances in the statistics of mark−recapture methodologies (see Gary White's Program Capture web site) and the PI's should take advantage of these innovations and maximize the information gained from the mark−recapture studies. In addition, it is unclear to me why mark−recapture studies couldn't be used to estimate total smelt population size in the Clifton Court Forebay.

If I were doing Task 5 I would use at least two and maybe three size classes of adult smelt (e.g., 60mm, 80mm and 100mm), especially because large individuals have been implicated in having a strong effect on smelt population dynamics (Bennett 2005). Conversely, maybe large smelt have low entrainment frequencies and consequently the population can withstand higher adult entrainment than is suspected.

As per earlier comments, it would have been nice to see a more complete description of how marking mortality will be estimated. There really should have been a thorough experimental design for this portion of the proposal −− the whole mark−recapture section of the project depends on it.

Task 7 is a crucial aspect of this proposal and the methods simply are not adequately described for an external reviewer to evaluate their probability of success. There should have been pages of information on this aspect of the proposal and there should have been a PI who was familiar with estuarine hydrology and particle movements to ensure that these sections were adequately described. The coupling of these estimates to the population model will strongly affect estimates of entrainment.

	It wasn't clear to me how the PI's will couple entrainment loss estimates to a population model (Task 8) to ultimately derive the impacts of entrainment on the smelt population in the Delta? finally how **The PI's also should examine Burnham &Anderson's book on information theoretic statistics and multi−model inference as well as hierarchical Bayesian modeling for the population model. Also how will differences in "water year" (i.e. drought, normal, or flood years)be incorporated in the model −− after all hydrological conditions affect the spatial distribution of smelt in the Delta (see Bennett 2005)? With Castillo's expertise in loop analysis I was surprised that such an analysis wasn't being employed in this project.**
Rating	**Sufficient**

Feasibility

Comments	**Yes the approach is reasonable and the PI's probably can accomplish what they've proposed (this is more certain for the culture aspects of the proposal where the methodology is well established).** **I don't have great confidence that the PI's will be able to successfully complete Task 7 given their lack of expertise in this area and the inadequate description of the methodology. I have some similar concerns about Task 8 as well.**
Rating	**Sufficient**

Budget

Comments	**In my opinion the budget is inflated − I just don't understand why CALFED is paying the salaries of state and federal employees that are performing tasks that are well within their employers mandates. Aren't Cal. Fish and Game**

	and USFWS responsible for managing the Delta and T species? Without greater production of publications in peer−reviewed journals I would not recommend full funding.
Rating	Inadequate

Relevance To CALFED

Comments	This proposal is highly relevant to the PSP priorities as well as CALFED client groups.
Rating	Above Average

Qualifications

Comments	The PI's have lots of experience in delta smelt biology and culture. Castillo and Fujimura have good publication records, although generally not in delta smelt biology and Castillo apparently has not published anything in a peer−reviewed journal since 2000. Morinaka and Poage have no publications in refereed journals. Lindberg and Baskerville have a substantial track record with grants dealing with Delta smelt biology but these grants have not really been translated into publications in refereed journals −− this gives substantial cause for concern. Nonetheless they appear to have "written the book" on culture of Delta smelt. I certainly am concerned by the 5 positions that are "to be determined", in perticular the subcontractor for the modeling. This is a critical phase of the project and the PI's should have been able to name a collaborator at this stage of the game.
Rating	Sufficient

Overall Evaluation Summary Rating

Comments	Strong points of the proposal are estimates of entrainment mortality and culture of smelt. Weak points are insufficient documentation to evaluate Task 7 and portions of Task 8. It's a

	mixed bag that with additional PI's and detail could have been a superior proposal.
Rating	**Above Average**

External Technical Review #2

Proposal Title: An Experimental and Modeling Approach to Evaluate Environmental Water Effects on Threatened Delta Smelt

Proposal Number: 0068

Proposal Applicant: U.S. Fish and Wildlife Service

Purpose

Comments	**The goals of this proposal are clearly stated and internally consistent for the goal of quantifying the extent of entrainment losses for juvenile and adult delta smelt in the South Delta. It is less clear whether the goal of quantifying entrainment losses for larval fish will be met. In addition, it is unclear whether the synthesis model for evaluating population response through the use of environmental water will be possible. The proposed work if completed as stated would be timely and important for understanding delta smelt population dynamics in the Delta, as losses from entrainment at the SWP and CVP have been identified as a critical information gap. The information would be helpful for improving environmental water management with respect to delta smelt recovery.**
Rating	**Above Average**

Background

Comments	**The conceptual model is slightly vague, although the attached diagram was helpful. The value of estimating entrainment losses was clear, however the proposal does not explain how different life stage estimate losses translate into population level effects. Additionally, the conceptual model fails to describe in detail how delta smelt data would be correlated with environmental water use data in the final synthesis model.**

Rating	**Sufficient**

Approach

Comments	**In general, the proposal clearly indicates who will be performing the tasks and resources are set aside to accomplish tasks (but see task 6–8 below). Products generated from this research such as reports, publications and final model would be extremely valuable and disseminated easily to the scientific and management community if completed. The synthesis model could be extremely valuable for resource managers working with environmental water. The approaches for tasks 6–8 are less defined and may have some problems. TASK 6: Analysis for mark and recapture was vague. The lack of detail makes it difficult to know how ANOVA would be used for comparisons. The way the proposal reads there will not be enough degrees of freedom to make multiple comparisons. It may be that because the authors have extensive experience with these experiments they excluded details. TASK 7: This task necessitates the use of subcontractors and other agency researchers for modeling assistance. For a project that is based on modeling, it seems odd that no one in charge of this task has modeling experience. Eighty hours of assistance from a subcontractor may not be adequate to complete this task. TASK 8: Similar to task 7, the details are vague in how this model will be created. Specifically the proposal fails to mention, 1) who has the skills to create a model using the Stella program, 2) how the model will incorporate all the existing data sets and predict population benefits (i.e. how will estimates of larval fish losses at the salvage facility affect the population?), 3) who is the unnamed statistical consultant who donates time freely (page 12), and 4) details on how the model will be calibrated and tested.**
Rating	**Sufficient**

Feasibility

Comments	The approach is documented for tasks 1–5 and the proposal indicates that the authors likely have experience enough to complete the majority of tasks in the proposal. The authors' ability to carry out tasks 7–8 successfully is doubtful. From experience and publications listed, it appears no author has modeling experience to generate the larval entrainment model or to create the synthesis model. The synthesis model itself seems like a huge undertaking and may not even be technically feasible given the existing data on delta smelt. However, a model described by the authors would be incredibly useful if created and calibrated well. Managers of environmental water would no doubt be relieved to have a predictive model to assist in maximizing use of environmental water accounts.
Rating	Inadequate

Budget

Comments	The budget is generally clear, however some unforeseen costs may have been overlooked. Task 7: The budget does not include in-kind donation for assistance from agency modelers. In addition, the budget only allows for 80 hours of paid assistance from a subcontractor. Unless the donation of time from other agency modeler is substantial, the amount of subcontractor training time may be greatly underestimated. Additionally, as none of the authors are modelers, likely task 8 will require subcontractor help and/or in-kind donation for those with modeling expertise.
Rating	Sufficient

Relevance To CALFED

Comments	The proposal attempts to address three CALFED priorities stated in the PSP. However, it is the modeling portion of the proposal that will primarily improve understanding of environmental water use and its affect of delta smelt populations. As stated previously it is the modeling that is the weakest part of the proposal. If the investigators can construct the model, then other CALFED objectives such as using models and existing data sets will also be met.
Rating	Above Average

Qualifications

Comments	Authors have extensive experience working in the Delta, conducting mark-recapture experiments proposed, and raising delta smelt for the experiments proposed. The infrastructure is available to accomplish the experimental portion of the proposal. From the proposal, the authors do not appear to be adequately qualified for accomplishing the modeling portion of the project without extensive help from collaborators (not accounted for in the budget).
Rating	Inadequate

Overall Evaluation Summary Rating

Comments	This proposal has great vision. A model developed from existing information on delta smelt that incorporated the experimental data to be generated in this research would greatly improve decision making strategies for environmental water managers. However, the authors did not demonstrate in the proposal that they are qualified to develop a quantitative model that would help improve understanding of environmental water usage as it relates to delta smelt population changes. Although any researcher can create a quantitative model, the predictive value and usefulness of a model is dependent on the information included the model as

	well as careful calibration and post hoc testing. The proposal would be greatly improved by elaborating on model development and having an investigator employed with modeling experience.
Rating	**Sufficient**

External Technical Review #3

Proposal Title: An Experimental and Modeling Approach to Evaluate Environmental Water Effects on Threatened Delta Smelt

Proposal Number: 0068

Proposal Applicant: U.S. Fish and Wildlife Service

Purpose

Comments	**The Goals and objectives are very clear and consistent. The basic goal of identifying the level of entrainment of delta smelt at the State facility has been a long-stand need in smelt protection but a need for which we lacked the tools to address. This is a research project, but it will be in many ways teh first of its kind so it may well be that its value will not come from answering the questins identified but in allowing us to develop the tools to address those questions.**
Rating	**Superior**

Background

Comments	**The conceptual models are clear and the research clearly addresses significant missing steps in teh conceptual model. The topic is of the highest management interest**
Rating	**Superior**

Approach

Comments	**The approach seems well-designed and appropriate but strikes me as strongly optimistic given several untested features of the proposal and differences from earlier previous studies. Project management and reporting are clearly laid out**
Rating	

	Above Average

Feasibility

Comments	**Several aspects of this project have never been done before and that must limit feasibility. However, for the first 7 tasks, no one is remotely as suited to address the issue as the proponents. Even if they do not succeed in their stated goals , the information generated will doubtless inform future work.** **I am concerned that the project manager has, as far as I can discern, no experience in team−leading or oversight of any similar scale of project.** **Finally some discussion of how they might respond to those points in the study that are most uncertain would give more comfort that the issues had been thoroughly wrestled with. What if they cannot produce as many fish as they hope to? What if higher temperatures and smaller fish result in no recoveries of fish in the salvage operation? Would they combine replicates or release them closer to the louvers or ??**
Rating	**Above Average**

Budget

Comments	**Costs, especially as modified by cost−sharing agreements make this an outstandingly valuable project in terms of likely return on the investment. Costs all appear reasonable and when reduced via cost share they become quite inexpensive for the work supported. The absence of any other people who could perform similar work would make even much more expensive work cost−effective.**
Rating	**Superior**

Relevance To CALFED

Comments	**Few topics could be more central to CalFed than the issues surrounding entrainment of delta smelt, which this proposal addresses. The proposal does an excellent job of puttnig the work in teh context of management issues anddescribing how results from this proposal could immediately increase the effectiveness of management actions.**
Rating	**Superior**

Qualifications

Comments	**Aside from the inexperience of the lead in leading such teams as this, the team is comprised of the ideal people to do the first 7 tasks.** **Their abilities to deal with task 8 are much less. Other funded projects are already underway and are attacking modeling at levels of detail and experience that this tam cannot approach.**
Rating	**Superior**

Overall Evaluation Summary Rating

Comments	**The first 7 elements of this project are an excellent investment of CalFed dollars. The likelihood of achieving the stated goals seems reduced because of the novelty involved in the project, but the effort will doubtless guide future work, even if the authors fail to answer all their questions. Task 8 seems superflous to me given that Bill Bennett and Wim Kimmerer –– both with heavy experience in modeling the ecology of delta smelt –– are recieving CalFed funding to similar work. Thus, I fear that the results of tasks 1–7 will not be exactly what the authors hope for and that a lack of those exact results will greatly reduce the likelihood that they will be able to perform task 8. On the oher hand, almost any**

	results that these authors get on entrainment rates will be readily incorporated into models that are already under development. Reducing the cost of this project by the amount dedicated to Task 8, makes the remainng portion a tremendous value and does not commit funds to the task that is most uncertain. **Some forthright talk about the differences between these studies (fish size, seasonal temperatures/predation rates among other things) that make successful completion of this proposal would have given me more confidence that teh authors have considered such things in their design. Their method of choosing release numbers does not seem to reflect of these concerns and I suspect that release numbers are constrained by other issues of how many fish they think a ramped−up hatchery effort can reliably produce. Forthright discussions of such things would increase my confidence that they are not being overly optimistic** **If the authors had discussed how their proposed modeling would integrate with that of others, it might appear more valuable, but as it is it appears to be an independent effort and as such an ineffective use of Calfed funds.** **I am also somewhat dismayed that the proponents do not more clearly lay out how their project will fit into other ongoing work and studies in the area −− VAMP studies both with CWT fish and radio−tagged fish will occur at the same time as these studies and comparisons of salmon results with smelt results would be mutually reinforcing. How reduced exports for VAMP might interfere with their salvage monitoring program would also have reflected a more thorough consideration of the problems they face. They describe outreach efforts to people working in the south delta, but enough is known about ongoing studies that much more could have been done.**
Rating	

	Superior